Vatican Observatory, Rome. Mr. A. W. Clayden exhibits a number of enlargements of cloud photographs taken by reflection from a black glass mirror, and he also shows the camera by which they were obtained. The mirror is placed in front of the lens so that the plane of the mirror makes an angle of about 33° with the axis of the lens. The mirror extinguishes the polarised light, and so causes the image of the cloud to stand out brightly on a dark background. Mr. Birt Acres contributes some fine specimens of cloud photography, as also do Dr. F. G. Smart, Dr. A. Sprung, Colonel H. M. Saunders, and Captain D. Wilson-Barker.

Some interesting photographs of several remarkable clouds are exhibited. Two of these show the "festooned cumulus" (or pocky cloud) that formed part of a storm-cloud which passed over Sydney, New South Wales, on January 18, 1893. Mr. H. C. Russell, F.R.S., exhibits two photographs illustrating the "southerly burster" (which is a violent inrush of Polar wind) at Sydney on November 13, 1893. The first was taken at 6 p.m., and shows the clouds preceding the "burster." In the second, which was taken an hour later, the "roll cloud" had come near enough for its peculiar character to be distinctly seen, and the evident rolling up of the cloud is very well shown, as well as the light rain squall which sometimes accompanies these winds. Three photographs of tornado clouds are exhibited, in two of which the cloud funnel was twelve miles distant, and in the third the spiral-shaped funnel is seen trailing at a considerable altitude in the air.

A collection of pictorial illustrations of clouds, from various meteorological works, is also set out in the exhibition. The earliest of these is a plate showing the method of measuring the height of clouds, by means of two theodolites, from J. F. Glöckner's *De Pondere Nubium*, 1722.

The instruments used for observing the direction of motion of the clouds are called "nephoscopes"; and of these there are several specimens in the exhibition, amongst them being those devised by Mr. Goddard, Herr Fineman, General R. Strachey, F.R.S., and Mr. F. Galton, F.R.S. These consist of circular mirrors with radial or parallel lines marked on them, the points of the compass being engraved on the outside of the frames. The direction of motion of a cloud is ascertained by turning the mirror on its axis until the image of the cloud passes along one of the lines. Photo-nephographs, designed by Captain Abney, F.R.S., and by MM. Teisserenc de Bort and G. Raymond, are also exhibited; as well as a model showing the manner in which the pair of photo-nephographs are mounted for use at the Kew Observatory, and the apparatus designed by the late Mr. G. M. Whipple for ascertaining the height, direction, and rate of motion of clouds from the photographs. In this case simultaneous photographs of a cloud are taken by two cameras half a mile apart, and fixed in such a way that their optical axes point to the zenith. The dark slides of the cameras carry a pair of fiducial lines at right angles to each other, and adjusted so that one of the lines shall be parallel to the measured base, and these lines are reproduced upon the cloud photographs. The two negatives are super-imposed in the sliding frames of the apparatus, which are then moved till the images of the cloud exactly coincide, when the parallax is given by a line joining the intersections of the fiducial lines. The parallax having been measured by a pair of compasses, the height of the cloud is at once determined by means of a prepared curve. A similar operation is then performed with one of the same negatives, and a second taken in the same camera after the lapse of one or more minutes. The pictures having been made to coincide as before, the distance between the intersections of the fiducial lines indicates the drift of the cloud. The direction of the drift is indicated by the position of the line joining the two intersections relatively to the fiducial line parallel to the base. The velocity of the drift, or the rate of motion of the cloud, is found graphically by means of a prepared diagram. Mr. R. Inwards exhibits a simple appliance for estimating the height of clouds of the roll-cumulus type by means of their perspective effect.

The exhibition includes a number of instruments invented or first constructed since the previous exhibition. Mr. R. W. Munro shows a very fine specimen of Dines' recording pressure-tube anemometer, as well as two other patterns of Dines' pressure and velocity gauge for use with the tube anemometer. Mr. J. J. Hicks exhibits Bartrum's open scale barometer, Callendar's compensating open scale barometer, Keating's hydrometer, and some useful and pretty circular levels with the fluid hermetically sealed. Mr. L. P. Casella shows Goad's geodetic altazimuth, a universal sun-dial, some artificial horizons, an alarm thermometer by MM. Richard Frères, and a hypsometer or boiling-point thermometer. Mr. H. Hainsby, a shoemaker at Shanklin, exhibits three ingenious instruments which he has himself devised and constructed. These are an inverted tube-hygrometer, a vapour condenser, and a compensating siphon evaporator for large water surfaces. Mr. H. N. Dickson shows a model of his bottle for collecting samples of sea water from moderate depths, and Dr. W. G. Black shows his louvered glass evaporator.

A number of sketches and photographs of meteorological phenomena are also exhibited, as well as photographs and diagrams of instruments.

A special feature of the exhibition is the large and interesting collection of lantern slides, nearly 300 in number, and mostly of cloud subjects.

WM. MARRIOTT.

NOTES.

THE next meeting of the American Association for the Advancement of Science will be held in August, at Brooklyn. The mayor of that city has just appointed a large and influential local committee to make arrangements for the meeting.

THE fine weather of the past few weeks has enabled General Pitt-Rivers, F.R.S., to resume his excavations at Wor-Barrow, a large twin-barrow near Woodyates, on the borders of Dorset and Wilts. An extensive section has been cut through the tumulus, and quite recently the work of the investigator was rewarded by the discovery on the *old surface line* of two human skeletons. Anthropologists will await with interest the results which may be deduced from the examination and measurement of these remains, and their relation to those already made by General Pitt-Rivers in the round barrows, and in the Romano-British settlements explored in the immediate neighbourhood.

THE Royal Commissioners appointed "to inquire and report what light-houses and light-vessels it is desirable to connect with the telegraphic system of the United Kingdom by electrical communication, for the purpose of giving information of vessels in distress or casualties at sea to places from which assistance could be sent, and of transmitting storm warnings," have presented their second report. Although the general question of signalling was not referred to the Commissioners, it is so intimately connected with the subject of electrical communication that they have considered it, and in the first report they stated that in cases "where the distance from the shore is not great, an improved system of distress-signals (distinct from the usual fog-signals) might, both at rock-stations and on light-vessels, prove an effective temporary substitute for the more costly expedient of electrical communication." This view has been confirmed by the experience gained during the last tour of inspection. The Commission therefore recommends that the general light house authorities be invited to consider the subject with the view of instituting a universal system of visual and sound signals at all the various light stations on the coasts of Great Britain and Ireland. Appended to these recommendations is a report by Sir Edward Birkbeck on the system of coast communication in Canada and the United States, from which it appears that while both these countries possess an efficient system of electrical communication round their coasts, none of the light-vessels are electrically connected with the main-land.

The Franklin Institute, through its Committee on Science and the Arts, has recommended the award of John Scott medals and premiums to Mr. F. Pontrichet, of New York, for his improved "black-print" process; Herr S. Riefler, of Munich, for the invention of a pendulum escapement for clocks of precision; and Mr. E. G. Acheson, of Monongahela City, for his invention of carborundum.

The Technical Instruction Committee of the Cheshire County Council have set aside £5000 towards an agricultural college in Cheshire, and £1,000 for the furnishing of it. The Royal Agricultural Society of England have promised the sum of £1000 towards the fund, and an offer of £500 has been received from a private donor. It is thought that £11,000 would be required for the college, and £1000 for its equipment.

Dr. A. H. Hassall died at San Remo, on April 9, at the age of seventy-six. He was the author of a work on British freshwater algæ, published in 1845, and of one on the microscopic anatomy of the human body, published in 1852. In 1850 he took up the question of food adulteration, and made a series of analytical reports, which led to a parliamentary inquiry into the pernicious and systematic adulteration that had been going on. He also assisted in the microscopical investigation of the water supply of London, especially during the cholera outbreak of 1854. In 1877 Dr. Hassall removed to San Remo, and there passed the remainder of a busy and useful life.

The Council of the Royal Society of Edinburgh have recently made the following awards:—The Gunning Victoria Jubilee Prize for 1891–94 to Dr. Alexander Buchan, for his varied, extensive, and extremely important contributions to meteorology, many of which have appeared in the Society's publications. The Keith Prize for 1891–93 to Prof. T. R. Fraser, F.R.S., for his papers on *Strophanthus hispidus*, Strophanthin, and Strophanthidin, read to the Society in February and June 1889 and in December 1891, and printed in vols. xxxv. xxxvi. and xxxvii. of the Society's Transactions. The Makdougall-Brisbane Prize for 1890–92 to Dr. H. R. Mill, for his papers on the Physical Conditions of the Clyde Sea Area, the first part of which was published in vol. xxxvi. of the Society's Transactions. The Neill Prize for the period 1889–92 to Mr. John Horne, for his investigations into the Geological Structure and Petrology of the North-West Highlands.

A very interesting series of experiments were lately made by Mr. Charles A. Stevenson, with a view to proving that it is possible to communicate between lighthouses and lightships without a submarine cable requiring to be laid. After a number of laboratory experiments, made with a view to ascertaining the size of the coils and the number of turns necessary to give workable results with the ordinary commercial telephones, some experiments on a large scale were tried near Edinburgh. Two coils, 200 yards in diameter, and each containing nine turns of ordinary telegraph wire, were erected on poles, a distance of 800 yards intervening between the two. So well did the system act that it was possible to read, by induction, the messages passing in the ordinary telegraph wires which were situated at a distance of 200 yards. After the sending of messages along this telegraph wire was stopped, it was found possible to send messages from one coil to the other with great ease.

The official report of the cases treated for hydrophobia at the Institut Pasteur during the past year has been drawn up by M. Henri Poltevin, and appears in the current number of the *Annales de l'Institut Pasteur*. The mortality table issued by the institute only includes those deaths from hydrophobia which occurred *after* the lapse of fifteen days from the date of the last inoculation, such deaths being regarded as taking place in spite of the treatment. Any deaths which happen within this prescribed period are excluded. Last year two such deaths occurred, and as three other cases ended fatally during the treatment, and one other in consequence of the patient refusing to permit the completion of the inoculations, these also are excluded. Out of the 1648 persons treated at the institute during the past year, observing the above reservations, only four died. Of these cases, 135 were admitted suffering from bites on the head, 857 from bites on the hands, and 656 from bites on the limbs. Since the commencement of the inoculations, in 1886, 14,430 persons have been treated at the institute, and out of this number only seventy-two deaths are recorded. The following table shows the nationality of the 188 foreigners who presented themselves for treatment at the institute. It is significant that England again has been by no means loth to avail herself of the benefits of the anti-rabic treatment in Paris, although the opposition to the establishment of a similar institute in this country remains unabated.

Nationality of the Foreigners treated at the Pasteur Institute in 1893.

Germany	2	Greece	35
England	23	Holland	9
Austria	1	India	14
Belgium	22	Morocco	1
Brazil	1	Portugal	6
Egypt	18	Russia	1
Spain	43	Switzerland	9
United States	1	Turkey	2

The last number of Dr. Danckelman's *Mitteilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten* bears evidence to the energy with which the officials of the German protectorates in Africa set themselves to the scientific study of the lands which they administer. Sets of meteorological observations for 1891 and 1892 at Bismarckburg in the Togo district, and at two stations in the Camaroons, are published with a partial discussion. The magnetic constants of the Togo district are also given, together with long lists of astronomically-determined positions in both West and East Africa. Dr. C. Lent gives a report on the scientific station on Kilimanjaro, which stands at 1560 metres above sea-level on the southern slope of the mountain. The work in progress at this station is the exact mapping of the immediate neighbourhood, which is being done by triangulation. A geological survey is being carried on simultaneously, with special reference to the character of the superficial soil, but including the determination of the volcanic and sedimentary rocks as well. Complete meteorological observations have been set on foot, and before long the scientific geography of this island of temperate climate, rising above the hot plains of East Africa, will be sufficiently known to allow the question of its suitability for permanent colonisation by Europeans to be put to a practical test in the conditions best likely to ensure success.

Dr. Oscar Baumann, whose successful journeys in Eastern Equatorial Africa we have frequently referred to, has written a short but valuable article on topographical surveying for travellers in the last number of the *Mitteilungen* for German protectorates, edited by Dr. Danckelman. Dividing the requisites for a complete topography into route surveying, compass bearings, measurement of altitude, and astronomical determination of latitude and longitude, he insists on the importance of all travellers being adequately instructed before setting out, so that they may use their instruments to the best advantage when in the field.

THE difficult question of the delimitation of the Congo State in the south-east, where the district of Lunda was in dispute with the Portuguese, has been settled by a commission consisting of the Rev. George Grenfell and Captain Gorin for the Congo State, and Lieutenant Sarmento for the Portuguese Government. The work of surveying and settling the frontier was completed in May last year, and the treaty was ratified at Brussels in March 1894. A map and brief report on the conditions of the border country are published in the *Mouvement Géographique*. The country is richly wooded, and *Elais Guineensis* is abundant at levels below 2000 feet. The commission did not meet with many animals, except on the rivers, and few birds were to be seen.

THE Lubudi, one of the upper tributaries of the Congo which joins the Lualaba about 9° south, was reported by Cameron on the strength of native rumour, and was not properly laid down on the map until the Katanga Expedition of Francqui and Cornet in 1892. An account of the river, with a map, is given in the last number of the *Mouvement Géographique*. The Lubudi rises on the high land known as Mount Kamea, the southern slopes of which drain to the Zambesi, and before it reaches the Lualaba follows a longer course than the main river itself. The confluence is somewhat remarkable, the two large rivers flowing parallel to each other for about a mile and a half, separated by a narrow strip of low alluvial land. The lower part of the Lubudi only has been explored as yet, although it has been crossed higher up by Mr. Arnott and others.

AN improved form of Blackburn's pendulum for the slow production of Lissajous's figures has been exhibited before the Istituto di Bologna by Prof. Augusto Righi. The ordinary simple form, in which a cup filled with sand is suspended by two strings joined in the shape of a Y, and the sand traces the compound oscillations about the two centres of suspension on a plate underneath, is unable to exhibit the figures obtained when the two periods are equal. In Righi's modification both the cup and the plate are suspended separately, and oscillate in planes at right angles to each other. By means of a clamp sliding vertically along the support, the cup can be given a great variety of periods, and a graduated scale enables the experimenter to adjust the two periods to any desired ratio. The strewing of the sand is controlled by a small valve at the bottom of the cup worked by an electromagnet, the current being transmitted along the suspending wires. This renders possible a very beautiful modification of the experiment. By making the current intermittent with regular intervals, the lines of sand are broken up into short pieces, whose length represents the velocity of the moving cup with respect to the plate. Another electromagnetic contrivance enables the observer to fix the exact phase of the vibrating plate at which the cup shall start on its own vibrations. The apparatus may easily be adapted to the composition of two oblique oscillations, and the curves, which are neat and sharply defined, may be fixed by means of steamed gum or sensitive paper.

IN dealing with refractive index as an aid in the elucidation of chemical constitution, one of the most important questions which has to be answered is how to eliminate or allow for the effect of wave-length. The relationships obtained vary with the colour of the light used. According to Maxwell's theory, for infinitely long waves the square root of K, the dielectric constant, is equal to the refractive index; $\sqrt{K}$ may therefore be taken as a measure of the "dispersion-free" refractive index. In the *Zeits. für phys. Chem.* xiii. 385, Jahn and Möller give a series of relative values of K for a number of liquids consisting of alkyl and aromatic halogen compounds and fatty acids. The communication forms an addition to that published by Landolt and Jahn (*loc. cit.* 10, 289) in 1892, and which dealt with liquid hydrocarbons. The first term, A, in Cauchy's dispersion formula has been generally used as giving the refractive index for infinite wave-length. The present work shows, however, that of all the above liquids the paraffins alone give values of $\sqrt{K}$ which approximate to those of A. The paraffins alone exhibit normal dispersion. Moreover, the values of the molecular refraction as calculated by means of $\sqrt{K}$ differ considerably from those obtained by using A or refractive indices for light of a particular wave-length such as the red hydrogen line. Indeed, isomers which have the same molecular refractions for the red hydrogen line may give values which differ considerably when K is used, and in general the values of K are largely influenced by chemical constitution. The communications are important contributions to the connections which exist between optical properties and chemical nature.

A CATALOGUE has been issued of works on Italian Literature, Art, Archæology, and History offered for sale by Mr. Bernard Quaritch.

M. A. KLOSSOVSKY has prepared a memoir (in Russian) on the climate of Odessa, from observations made at the Meteorological Observatory of the Imperial University.

THE *Zoologischer Anzeiger*'s index to the zoological literature of the second semester of last year has just been published. The titles are classified under forty-one heads; hence there is little difficulty in finding the various papers.

MM. J. B. BAILLIÈRE ET FILS, of Paris, have issued a catalogue of old botanical works (prior to the nineteenth century) and works on the history of botany, comprising more than 1000 volumes and pamphlets.

PROF. W. TRELEASE reprints, from the fifth annual report of the Missouri Botanic Garden, a monograph of the American species of two little-known genera of Onagraceæ, *Gayophytum* and *Boisduvalia*.

FURTHER papers have been issued by Mr. C. A. Barber on the "Diseases of the Sugar-cane in the West Indies," and suggestions made for their remedy, which consist chiefly in the selection of those strains which appear to be least susceptible to the disease.

IN *Bulletin* No. 9 of the *Minnesota Botanical Studies* is an interesting article by Miss Josephine E. Tilden, on the elaters of the Hepaticæ, especially of *Conocephalus*, in which their tendency to branching is described. In a young state the elaters always contain starch.

MESSRS. BAILLIÈRE, TINDALL, AND COX have re-issued the second edition of Mr. Henry Penning's "Text-Book of Field Geology," published in 1879. The book contains a section on Palæontology, by Mr. A. J. Jukes-Browne.

MESSRS. BAILLIÈRE have also published a fourth edition of Mr. C. T. Kingzett's "Nature's Hygiene," the first edition of which appeared fourteen years ago. The book has been carefully revised, and a chapter has been added on the subject of phagocytosis and immunity, as well as one on alimentation and foods.

A VOLUME containing the results of magnetic and meteorological observations made at the Government Observatory, Bombay, during 1891 and 1892, under the direction of Mr. Charles Chambers, F.R.S., has recently been issued. The publication also includes a paper on the secular variation of magnetic dip at Bombay.

MM. TH. AND E. DURAND, of Brussels, are preparing for publication, with the assistance of other orchidologists, a *Census Orchidearum*. In this work will be enumerated about 8000 species of orchids, with their synonyms, spontaneous or cultivated varieties, and natural or artificial hybrids. For each species will be given the place and date of first publication, a reference to the figures, and the geographical distribution. The work will probably extend over more than 1000 pages, and is intended to be published in five fascicules, at six francs the fascicule to subscribers.

AN interesting account, by Sir Archibald Geikie, of the nature and extent of the work carried on by the Geological Survey, is contained in the *Journal* of the Royal Agricultural Society of England (vol. v. part i. March). The *Journal* also contains, among other papers, one by Mr. C. F. Archibald, on useful and injurious wild birds, the birds described being warblers, tits, pipits, buntings, and finches. Mr. Archibald's contribution should be read by all agriculturists who wish to be able to distinguish their friends from their enemies.

PROF. S. H. GAGE'S excellent work on "The Microscope and Microscopical Methods" (Comstock Publishing Co., Ithaca, N.Y.), reviewed by us in September 1892, has reached a fifth edition. We have received part i., dealing with the microscope and histology; part ii. is in preparation, and will deal with the application of the microscope to study and investigation in vertebrate histology. The edition has been considerably enlarged, the additions including a chapter on photo-micrography. The expansions and emendations have been judiciously carried out, thus adding to the value of one of the best elementary works on the technique of the microscope.

A BIOGRAPHICAL sketch of Dr. Marcellus Malpighi, the distinguished physiologist and investigator, whose researches have figured in medical treatises since the middle of the seventeenth century, appears in *The Asclepiad* (vol. x. No. 40), accompanied by his portrait. Though he seemed to have worked with a simple microscope not better than a half-crown lens of the present time, he made some very important discoveries. He was elected a Fellow of the Royal Society in 1668, and between 1671 and 1684 contributed eight papers to it. His complete works, very copiously illustrated, were published by the Royal Society in 1686, in two volumes. Sir B. W. Richardson, the author of the biography, summarises most of Malpighi's work, comparing it with other physiological and anatomical researches of the seventeenth century, and with the knowledge that has since been gained.

A USEFUL journal for bacteriologists is *Modern Medicine and Bacteriological Review*, the "Bulletin of the Sanitarium Hospital and Laboratory of Hygiene, Sanitarium, Battle Creek, Michigan." It is edited by Dr. J. H. Kellogg, Superintendent of the Sanitarium and Hospital at Battle Creek, and the number before us not only contains three original papers by him, but a translation, also, of a paper by Prof. A. Charrin, M.D. A special section is devoted to "Bacteriological Notes," whilst abstracts and notes of medical and other papers are freely scattered throughout the journal. Articles on special subjects also form an important feature in this magazine. Amongst the twenty-two collaborators whose names figure on the cover we note that of Prof. Metchnikoff, of Paris. Following the usual complement of advertisements, we find a picture of the Sanitarium Hospital, and three pages setting forth its special objects, as well as its constitution and management.

AN illustrated official handbook to the aquarium, picture galleries, and museum collections under the control of the Exhibition Trustees, Melbourne, has been compiled by Mr. James E. Sherrard. The Melbourne Exhibition Aquarium was opened in 1885, and was the first established in Australia. Some useful experiments have been carried out by workers in it, pointing the way to further developments of the fishing industries of the colony. Mr. Sherrard's little handbook contains a large amount of information about the fish of Victoria, and the aquarium equipment. He has made a number of experiments with a view to keeping fish alive in artificial sea-water, but only with partial success. In sea-water, prepared according to chemical analysis, the fish became blind and only lived a few days. In water brought up to a standard strength with refined salt made from sea-water, the more hardy kinds of fish did very well, and in water made with Southall's sea-salt the fish seemed quite as much at home as in their natura element.

THE volume of *Transactions of the Sanitary Institute* for 1893 has been received. It includes papers read at the sessional meetings of the Institute, reports of a series of lectures on the sanitation of industries, and two lectures delivered to sanitary officers. We have also received the first number of the *Journal of the Sanitary Institute*, which it is intended to issue quarterly, in place of the annual volume of *Transactions*. The journal contains a paper on the etiology, spread and prevention of diphtheria, by Dr. R. Thorne Thorne, C.B., F.R.S.; one on the sanitation of places where food is prepared, by Dr. F. J. Waldo; and a report of a lecture on sanitary building construction, by Mr. Keith D. Young. Mr. G. J. Symons, F.R.S., contributes a list of works and papers on sanitation, and Prof. A. Wynter Blyth is the author of notes on legislation and some recent law cases. As the journal is a new development, a short epitome of the history of the growth of the Institute forms an appropriate introduction to its contents. The next Congress of the Institute will be held at Liverpool from September 24 to 29. The Health Exhibition in connection with the Congress will remain open until October 20.

A REPORT, by Mr. F. V. Coville, on the botany of the expedition sent out in 1891 to make a biological survey of the region of Death Valley, California, has been received from the U.S. Department of Agriculture. The botanical work undertaken by Mr. Coville was to collect and identify the plants of the region traversed by the expedition, to collate those data which had references to the range of species, and to arrange the material accumulated in such form that it would be useful in studying the facts and problems of geographical distribution. The report contains an itinerary, a section on the principles of plant distribution, and one on the distribution of plants in South-eastern California. In the section devoted to the characteristics and adaptations of the desert flora, a statement is given of the environmental conditions of the Death Valley desert region, and the resultant adaptive modifications of the flora are discussed. The report also contains a systematically arranged catalogue of the plants collected, a list of specimens, and a bibliography. We note that the metric system of linear measurements is used throughout the report, the itinerary excepted. The mass of matter brought together by Mr. Coville, and the fine plates which illustrate his descriptions, call for the highest commendation. By making grants for the expedition, the United States Congress has shown that it understands the importance of accumulating scientific observations, while the organisation of the work reflects great credit upon the Department of Agriculture.

Mr. Victor Collins has compiled a catalogue of the library of the late Prince Louis-Lucien Bonaparte, and it has just been published by Messrs. H. Sotheran and Co. Prince Bonaparte's collection of linguistic works is regarded by many authorities as the finest in the world. From his youth upwards, he devoted his best energies and talents to the formation of his library. His high social position and rare literary attainments allowed him to give full scope to his philological enthusiasm, and assisted largely in the attainment of his ambition. According to Mr. Collins, the primary object of the Prince was the acquisition of works on every language and dialect represented in Europe; but in the course of years his ambition went further, and he collected specimens of every known language which possessed even the most rudimentary literature. Though it must always be a matter of regret that Prince Bonaparte did not carry out his intention of compiling a catalogue of his library on a scientific basis, Mr. Collins' compilation will be of considerable assistance not only to the bibliophile, but also to the philologist. The books are classified into three divisions, dealing respectively with monosyllabic, agglutinative, and inflectual languages; and the list of them covers more than seven hundred pages. We have previously noted that these linguistic treasures are for sale *en bloc*. It is to be hoped that they will be acquired by some learned institution, where they may be studied at leisure by experts, for they afford a unique means of research on the relations of languages and dialectal connections.

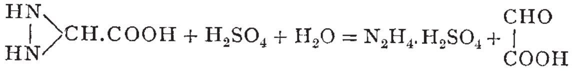
During the year 1892, Mr. W.B. Evermann spent six months on board the U.S. Fish Commission steamer *Albatross*, and made some interesting observations on the Ptarmigan of the Aleutian Islands (*Proceedings* Indiana Acad. Sci. 1892, p. 78). Among the birds collected were Willow Ptarmigan (*Lagopus lagopus*) and Rock Ptarmigan (*L. rupestris*) from Kadiak Island. The former ranges near the bases of the mountains and among the sparse willow growth of the lower portions of the island. At the time of Mr. Evermann's visit, the snow had melted from considerable areas frequented by this species, while higher up the mountains, where the Rock Ptarmigan was found, and where there was little or no woody vegetation, the snow covered everything completely. The principle of adaptation to environment was clearly illustrated by these two species. The one which ranged in the region still covered entirely with snow had not begun to change from winter to summer plumage; not one of the sixty odd specimens collected showing a single brown feather; the plumage of every one was a solid white. This was not so, however, with the Willow Ptarmigans. Their plumage had began to change with the slowly melting snow, and in most cases the head and neck had almost completely changed to the summer brown, while brown feathers were scattered here and there through the rest of the plumage. It is easy to see, Mr. Evermann points out, that it is greatly to the advantage of each of these species to change from winter to summer plumage synchronously with the melting snows; too rapid or premature change, as well as change too long delayed, would defeat the object of protective colouration.

During the last few days Mr. Rowland Ward has had on view, in his Piccadilly establishment, a remarkably fine specimen of the so-called white rhinoceros (*Rhinoceros simus*). The late Mr. Burchell described this rhinoceros many years ago, and reported it as very numerous at that time at Latakoo. It is the largest of the genus, and has now become nearly if not quite extinct. Some ten years since Mr. F. C. Selous shot a specimen in Mashonaland, which he gave to the Cape Town Museum, and beyond one other which was shot by the late Mr. J. S. Jameson whilst hunting with Mr. Selous, no authentic records of any specimen of this rare animal have been published. Mr. R. T. Coryndon shot two specimens early in July 1893, both of which have been modelled by Mr. Ward. On account of the weight of the specimens the skins were cut up into several pieces, which has made the work of modelling them one of the greatest difficulty. The largest rhinoceros is to form part of the Hon. Walter Rothschild's collection at the Tring Museum; the remaining one, which is not yet completed, has been acquired by the trustees of the Natural History Museum. The specimens are adult males, and the two skeletons are being macerated. Mr. Coryndon is leaving England again in a few days, his object being to travel to the northern end of Lake Tanganyika, in Central Africa, and to station himself there, build a permanent station, and collect insects, moths, butterflies, birds and small mammals for several English collections and museums. He hopes to gain some definite information in regard to the supposed new species of rhinoceros, and to determine the exact geographical district of the square-mouthed rhinoceros, the animal exhibited by Mr. Rowland Ward.

Dr. K. von Chrustschoff, of St. Petersburg, has recently succeeded in preparing artificially the cubic modification of silica, which was discovered some years ago by Von Rath, and called christobalite. The manner in which the substance has been formed is as follows: Dry crystals of boric acid are saturated with dry silicon-tetrafluoride gas, when it is found that the boric acid crystals swell up and give rise to a very voluminous white mass, which is a combination of boric acid and silicon-tetrafluoride. This substance being thrown into an excess of dilute ammonia, gives rise to borate of ammonia, which is easily dissolved, and a white residue, and must be repeatedly washed with ammonia, water and alcohol, till every trace of the ammonia and boric acid is removed. The snow-white granular mass, which is not in the least gelatinous, is soluble to such an extent in pure water that aqueous solutions containing from 5 to 7 per cent. of silica can be obtained. Once dried, however, the solubility of the silica is completely destroyed. The silica thus prepared, with water containing a slight trace of hydrofluoric and boric acids, is introduced into the platinum apparatus used by the author in his previous experiments in mineral synthesis, and is heated to 200° C. for two hours, under a pressure of from fifteen to twenty atmospheres; when clear and colourless crystals from 0·1 to 0·3 mm. in diameter make their appearance. These crystals were isolated by treating the mass with alkalies and dilute hydrochloric acid. The crystals are found to be various combinations of the octahedron, cube and rhombic dodecahedron; they are completely isotropic, and show no trace of the anomalous double refraction described by Mallard and others in the natural crystals. On analysis they yielded 99·78 per cent. of silica.

A new mode of demonstrating the electrolysis of hydrochloric acid upon the lecture table is described by Prof. Lothar Meyer in the latest issue of the *Berichte*. As the late Prof. von Hofmann himself pointed out, in describing the well-known apparatus for this purpose which bears his name, the electrolysis of hydrochloric acid is not a very satisfactory experiment, as it invariably happens, even when the acid has been previously saturated with chlorine gas, that the volumes of hydrogen and chlorine obtained are unequal, the hydrogen being considerably in excess. A somewhat nearer approximation to equality is obtained by employing, as recommended by von Hofmann, a concentrated solution of common salt mixed with ten per cent. of the strongest hydrochloric acid, but even in this case the volume of the chlorine is always less by some few cubic centimetres than that of the hydrogen. This discrepancy is due to the fact that after closing the taps of the collecting tubes, the liberated gases accumulate under continually increasing pressure, the liquid being forced up the reservoir tube, and under this higher pressure the liquid is able to take up more chlorine, and hence a portion of the rising gas is absorbed. This difficulty is overcome by adopting the following arrangement:—The two collecting tubes, joined as usual by a connecting cross tube near their lower ends, are made shorter than usual and without taps. The upper end of each is connected by a ground joint or a piece of thick caoutchouc tubing with a delivery tube bent outwards horizontally at a little distance above the joint; each delivery tube is sealed, a few inches along the horizontal limb, into a three-way tap which forms the summit of a measuring cylinder standing in a glass trough, and upon the other side of the tap the delivery tube is continued for a short distance as an exit tube. The carbon electrodes are not cemented in glass enclosing tubes, but merely closely fitted with loose enveloping tubes, in order to prevent admixture of the gases in the connecting cross tube. In order to carry out the experiment the electrolysis vessel is three-fourths filled with ordinary strong acid, the delivery tubes attached, the glass trough on the cathode side nearly filled with water, and that on the anode side with chlorine water. By attaching an aspirator, conveniently in the form of a caoutchouc ball, to the short exit tube attached to each three-way tap, the liquids in the troughs may be drawn up to the tops of the measuring cylinders; when this is achieved the aspirator is removed, and the taps so arranged that the measuring vessels are shut off and the electrolysis apparatus is open to the air. The electrical circuit is then completed, and the gases allowed to escape for a few minutes, during which they may be shown to be chlorine and hydrogen, the former by its action upon starch and potassium iodide paper, or indigo solution contained in a test tube held under the mouth of the exit tube, and the latter by collecting a quantity in another test-tube held above the open end of the other exit tube, and igniting the gas. Both taps may then be simultaneously turned so as to shut off the electrolysis apparatus from the air, and connect it with the measuring cylinders, when the gases will rapidly fill the latter to precisely the same extent. When sufficient has accumulated the current may be switched off, or the measuring vessels closed by suitable movement of the tap, and the volumes of the two gases shown to be exactly equal.

FURTHER details of the preparation of the salts of di-amidogen, hydrazine, $\begin{matrix}NH_2\\|\\NH_2\end{matrix}$, from the interesting diazo-derivative of acetic acid, $\begin{matrix}N\\\|\\N\end{matrix}\!\!>CH\,.\,COOH$, are given in the current number of the *Berichte* by Prof. Curtius and Dr. Jay. Diazoacetic ether is first prepared, essentially as follows. Equal weights of chloracetic acid and ammonium chloride are dissolved in water, and twice as much powdered lime added by degrees, so as to avoid undue heating. After standing the liquid is saturated with hydrochloric acid and converted by evaporation over the water bath to a yellow solid. This product is subsequently dissolved in alcohol and again saturated with hydrochloric acid gas, after which the alcohol is removed and the residue dissolved in water. In order to diazotise it sodium acetate is first added, so as to modify the action of sodium nitrite, then ice and sodium nitrite, when diazoacetic ether is formed and may be extracted by means of ether. In order to obtain the hydrazine salt from diazoacetic ether, the latter may be reduced either with ferrous sulphate and soda or zinc dust and soda, the former reducing agent being preferable, and affording 92 per cent. of the theoretical yield. Upon acidification with the acid whose hydrazine salt is required, the salt in question is produced. The theory of the reaction is that hydrazoacetic acid, $\begin{matrix}HN\\|\\HN\end{matrix}\!\!>CH.COOH$, is formed upon reduction of diazoacetic ether in alkaline solution, and that this substance is decomposed by acids with formation of a salt of hydrazine and glyoxylic acid. Thus, with sulphuric acid hydrazine sulphate is produced as follows:—



$$\begin{matrix}HN\\|\\HN\end{matrix}\!\!>CH.COOH + H_2SO_4 + H_2O = N_2H_4.H_2SO_4 + \begin{matrix}CHO\\|\\COOH\end{matrix}$$

The silver salt of the unstable hydrazoacetic acid has actually been isolated from the liquid by action of silver nitrate. It is an insoluble substance which yields crystals of hydrazine sulphate upon addition of dilute sulphuric acid and evaporation. The glyoxylic acid by-product has also been isolated in the form of its hydrazone by addition of phenyl hydrazine. Hence the above reaction, memorable as the one by which Prof. Curtius first isolated di-amidogen, is now fully cleared up.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♂) from India, presented by Mr. Robert O'Callaghan; a Macaque Monkey (*Macacus cynomolgus*, ♀) from India, presented by Mr. J. Pearson Callum; a Meller's Duck (*Anas melleri*) from Madagascar, presented by Mr. H. H. Sharland; a Rose Hill Parrakeet (*Platycercus eximius*) from Tasmania, presented by Mrs. Carter; a Smooth Snake (*Coronella lævis*) European, presented by Mr. Ignatius Bulfin; a Cape Zorilla (*Ictonyx zorilla*) from South Africa, a Hairy Armadillo (*Dasypus villosus*) from La Plata, two Rabbit-eared Perameles (*Perameles lagotis*) from Western Australia, an Adorned Ceratophrys (*Ceratophrys ornata*) from South America, three White's Tree Frogs (*Hyla Cærula*). four Golden Tree Frogs (*Hyla aurea*) from New South Wales, deposited; a Tayra (*Galictis barbara*), a —— Coot (*Fulica*, sp. inc.), an Orange-chested Hobby (*Falco fusco-cærulescens*) from South America, purchased; a Bennett's Wallaby (*Halmaturus bennetti*, ♀) from Tasmania, received in exchange; three Raccoons (*Procyon lotor*), a Crested Porcupine (*Hystrix cristata*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE PRESENCE OF OXYGEN IN THE SUN.—At the meeting of the Paris Academy of Sciences on April 9, Dr. Janssen described a convenient method of raising gases to a high temperature, used by him in connection with investigations on the spectrum of oxygen. The question of the presence of oxygen in the gaseous envelopes of the sun comes under two distinct cases. In the first place, oxygen may exist in the exterior parts of the corona, that is to say, in a medium where the temperature approaches that of the terrestrial atmosphere. In this case the spectrum of the gas would be similar to that which is produced by our atmosphere, and, in order to prove its absence in such parts of the coronal envelope, it is sufficient to show that the lines and bands due to oxygen in the solar spectrum are entirely produced, both as regards number and intensity, by the earth's atmosphere. Dr. Janssen's observations from the summit of Mont Blanc, and his experiments at Meudon, have been made with a view of settling this point. But the case of observations on oxygen at ordinary temperatures only represents a part of the question. Any oxygen existing in the lower portions of the corona, in the chromosphere, and in the photosphere, must be at a high temperature, and in order to decide, by means of spectrum analysis, as to whether it is present or not in these solar layers, it is necessary to know the modifications which the spectrum of oxygen undergoes when the temperature of the gas is elevated. This research, however, is attended with special difficulties. The absorption lines and bands of oxygen are only produced by great thicknesses of the gas. The B group, for example, only appears in the spectrum when a